Online Water Quality Monitoring Systems

Drinking Water Security & More

U.S. Army Center for Health Promotion and Preventive Medicine

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Report Documentation Page

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AGENDA

PURPOSE: Explain the usefulness and real-world considerations of using online water quality monitoring systems in DoD drinking water distribution systems

1. Introduction
2. How it works
3. Design
4. Implementation strategy
5. What else can be done

Introduction

- Public health surveillance
  - 911 calls
  - Emergency room visits
  - Over-the-counter drug sales
  - RODS/ESSENCE databases

Introduction

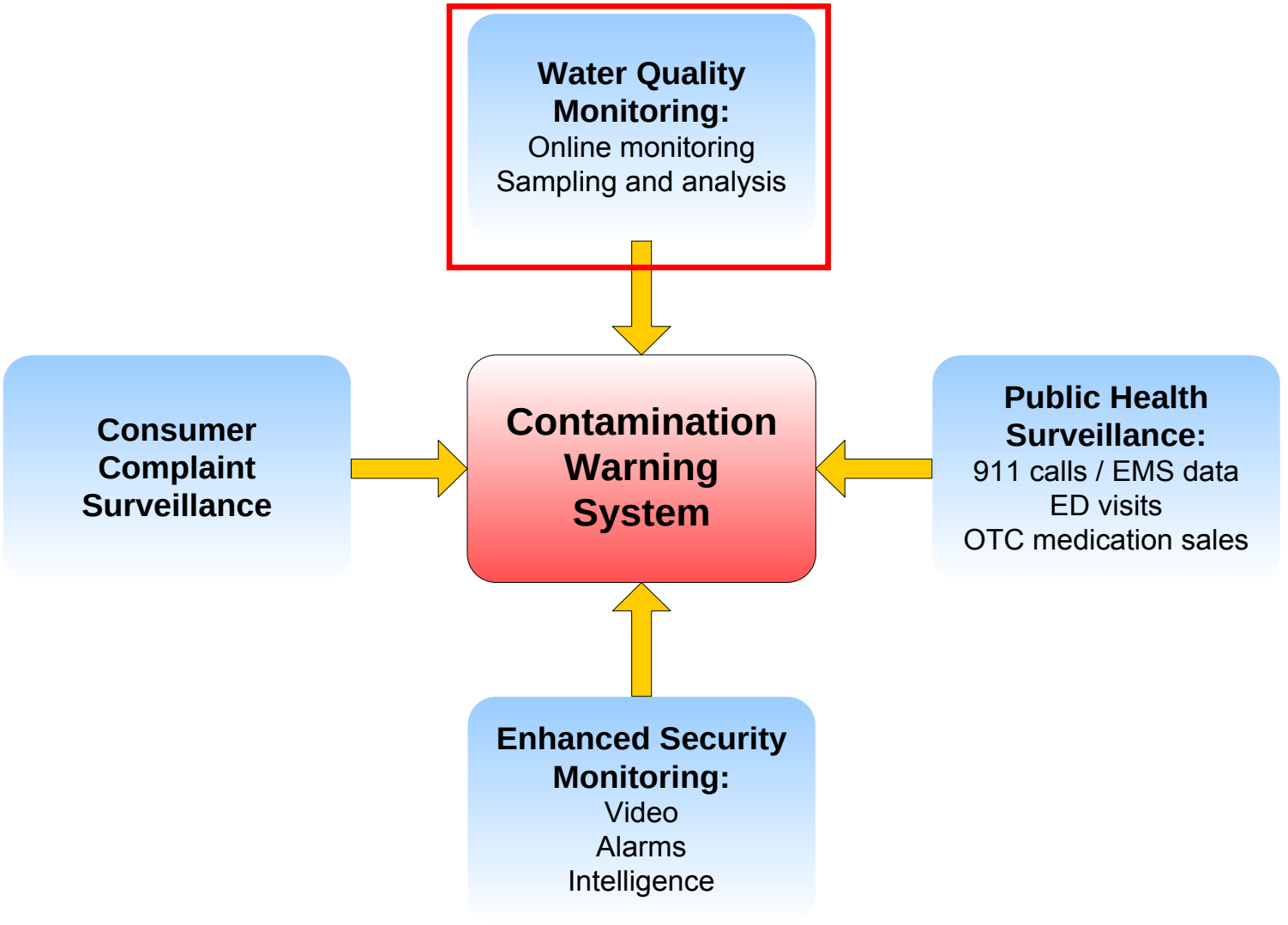
- Enhanced physical security
  - Intrusion/motion detection
  - Remote valve operation/isolation
  - Recording closed circuit TV

Introduction

- Consumer complaint tracking
  - Centralized system
  - Analyze data
    - Spatial
    - Temporal
    - Water quality

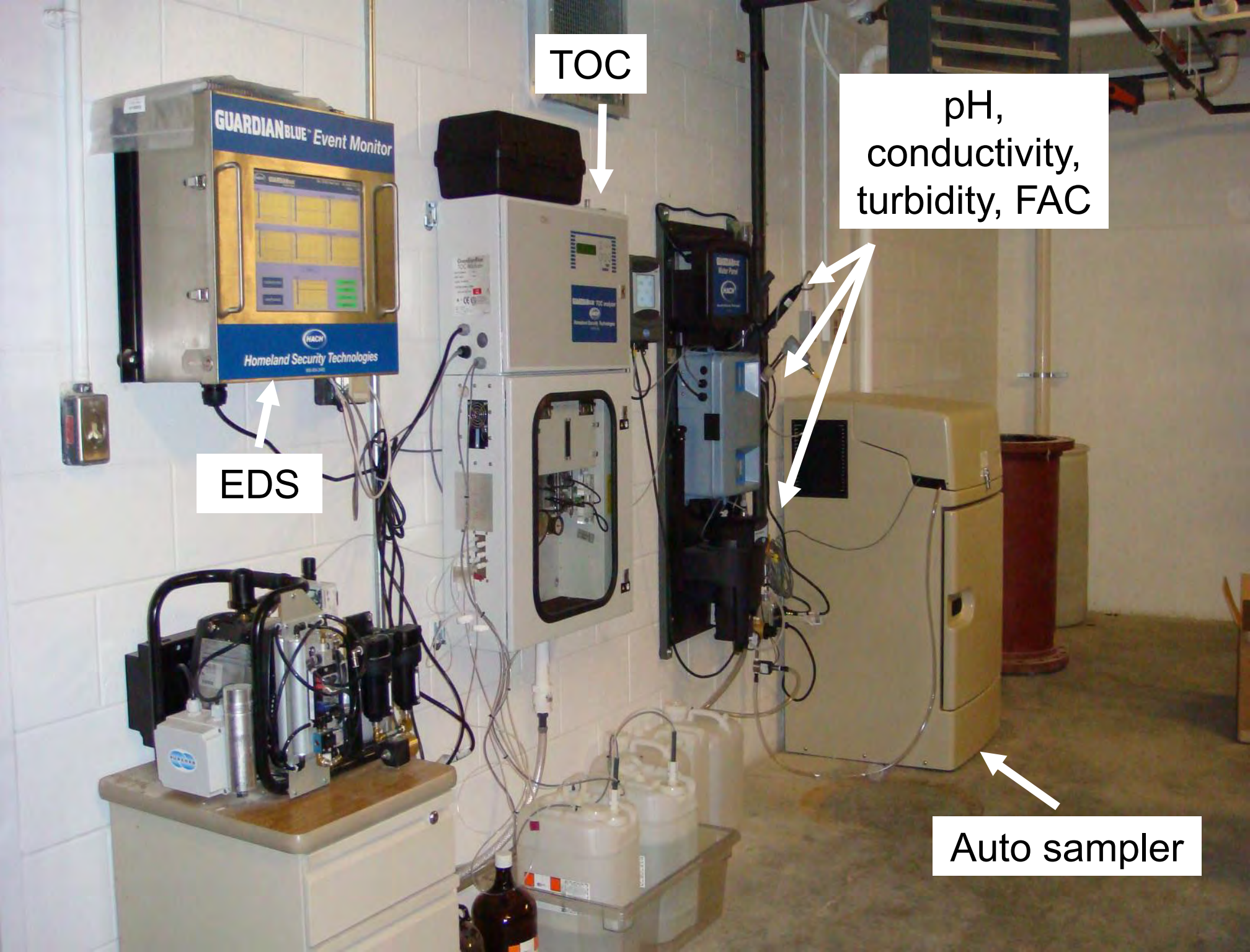
Introduction

- Security - EPA's Contamination Warning System



How it Works

- A group of online water quality parameter monitors located at sites in the distribution system
  - Free Available Chlorine (FAC), conductivity
  - pH, Total Organic Carbon (TOC)
- Good indicators of contamination
- Software analyzes data to detect and identify abnormal water quality events
  - Event Detection System (EDS)

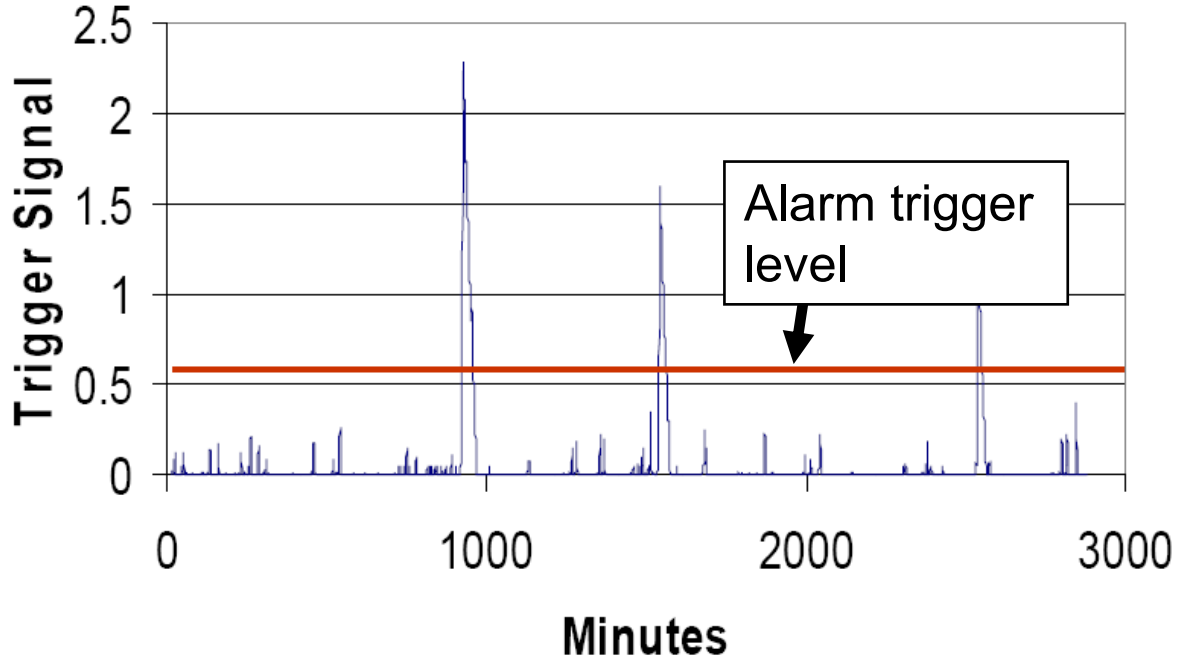

TOC
pH,
conductivity,
turbidity, FAC
GUARDIAN BLUE Event Monitor
Homeland Security Technologies
EDS
Auto sampler


GUARDIANIII Event Monitor

How it Works

Online Water Quality monitors

EDS



Reference: HACH Homeland Security Technologies, http://www.hachhst.com/uploadedFiles/Hach's_Water_Distribution_Monitoring_System/How_It_Works/Monitoring%20for%20Contamination%20Events.pdf

Water Plant

How it Works - Other Benefits

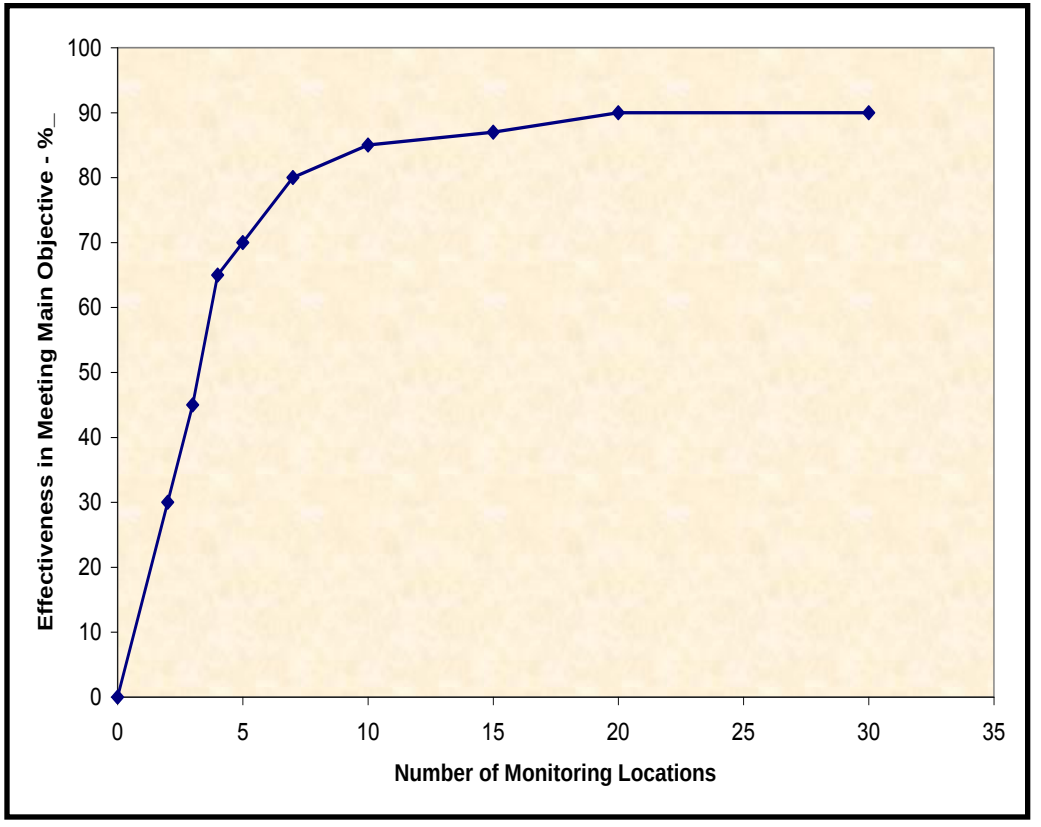
- Better understanding of distributed water quality
  - Replace or supplement existing monitoring locations
- Identify routine events degrading water quality
  - Treatment plant process procedures
  - Pump operation
- Identify non-routine events degrading water quality
  - Pipe breaks
- Improved relations & communication

Design

- Consider goal(s)
  - Increase protection of public health
  - Increase protection of mission-critical facilities
- Determine monitoring equipment & pilot test
  - Most promising parameters
    - Free available chlorine (FAC)
    - Total organic carbon (TOC) or UV_{254}
    - Conductivity
  - Event detection system
  - Packaged systems vs. individual components
  - Look to 3rd party evaluations
    - Environmental Technology Verification (ETV)
    - Technology Testing & Evaluation Program (TTEP)

Design

- Determine locations & number
  - Use optimization software
  - Need hydraulic model
  - Vetted by
    - Water system personnel
    - Force protection



Implementation Strategy

- Ensure long-term funding available
- Develop hydraulic model & calibrate to simulate water quality
- Involve installation organizations early and often
- Determine design & installation issues (short-term)
  - Equipment & capital costs
  - Monitoring locations and number
  - Communication with existing IT infrastructure
- Startup & operation (long-term)
  - Responsibilities
  - Operation and maintenance
  - Consequence management plan

Implementation - Hydraulic Model

- Must have accurate distribution model
  - Hydraulic & water quality
- Multiple benefits
  - Master planning
  - Fire flow analysis
  - Unidirectional flushing
  - Regulatory compliance
- Challenges
  - Lacking data
    - Infrastructure – outdated maps
    - Usage/demand - no metering, leak detection
  - Cost

What Else Can be Done?

- Reduce risk of intentional contamination
  - Ensure effective distribution system programs
    - Cross-connection control
    - Valve exercising
    - Unidirectional flushing
    - Consumer complaint handling
  - Exercise your Emergency Response Plan (ERP)
  - Implement distribution system operational monitoring
    - Increase frequency & location with FPCON
  - Set system up for hydraulic model in future
    - Update maps
    - Install meters
    - Leak detection
  - Implement other components of CWS

Additional Resources

- EPA Water Security Initiative

http://cfpub.epa.gov/safewater/watersecurity/initiative.cfm

- EPA Technology Testing & Verification program

http://www.epa.gov/nhsrc/ttep.html

- EPA Environmental Technology Verification program

http://www.epa.gov/etv/


Questions?